

## Purpose

This report provides a description of the routes that were identified by Inyo County in the request for proposal. Some of the routes may become candidates for the shipment of High-Level Waste (HLW) en route to Yucca Mountain. It is possible that all of these routes will be considered as alternative routes for truck shipment of HLW. The most detailed information is provided for the California routes. Detailed data about both the California and Nevada routes is provided in the attached DVD.

## Organization

The report provides technical details that are used for Task 4-the transportation risk assessment. The report describes three classes of information. The first part describes each route in terms of its: 1) Average Annual Daily Traffic (AADT), 2) trends in AADT, 3) seasonal and hourly traffic peaking and 4) traffic composition. Key roadway design characteristics for each route are also examined. Then the report describes some special events and special traffic generators that contribute to trip making in the area. These are included to assist in understanding what creates seasonal and casual travel in the area.

## Contributors to Trip-Making in the Region

### Death Valley National Park

The main traffic generator in the region is Death Valley National Park, with approximately one million visitors annually.

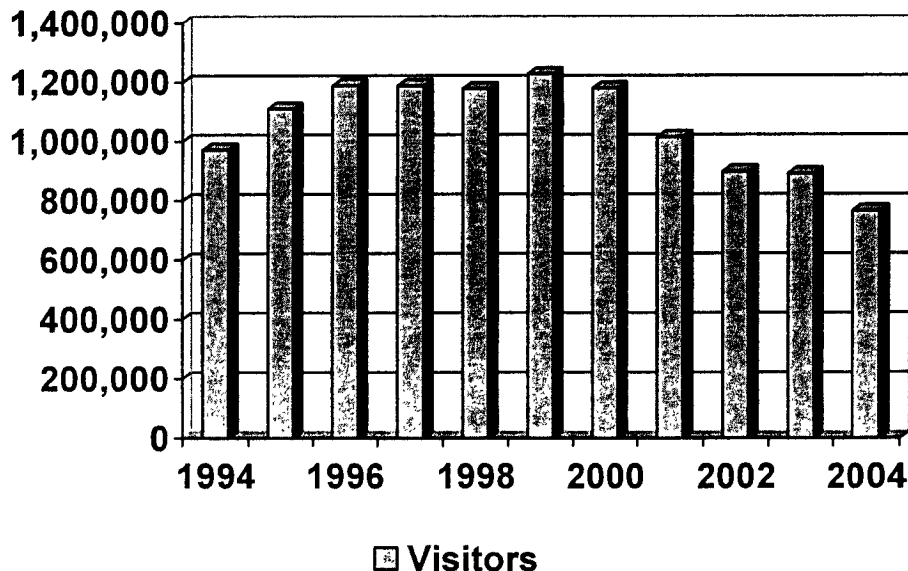


Figure 1 Annual visitation to Death Valley National Park 1994-2004

Since 9/11, park visitation declined dramatically and is only slowly returning to its pre-attack levels. Spring is the primary season for visitors to the park. The most recent data

for 2004 shows that the primary month for travel to the park is April. The monthly distribution of visitors is in the table below.

Month	Year	Recreation Visits	Non-Recreational Visits	Total Visits
January	2004	52,401	1,975	54,376
February	2004	64,861	2,546	67,407
March	2004	96,111	3,638	99,749
April	2004	96,662	3,617	100,279
May	2004	77,981	2,930	80,911
June	2004	60,618	2,424	63,042
July	2004	80,405	3,084	83,489
August	2004	50,191	1,862	52,053
September	2004	59,984	2,265	62,249
October	2004	52,428	1,874	54,302
November	2004	46,480	1,731	48,211
December	2004	26,698	964	27,662
<b>Totals:</b>		<b>764,820</b>	<b>28,910</b>	<b>793,730</b>

Figure 2 Monthly visitation to Death Valley National Park (2004)

The monthly trends in Death Valley Park visitation is depicted graphically below.

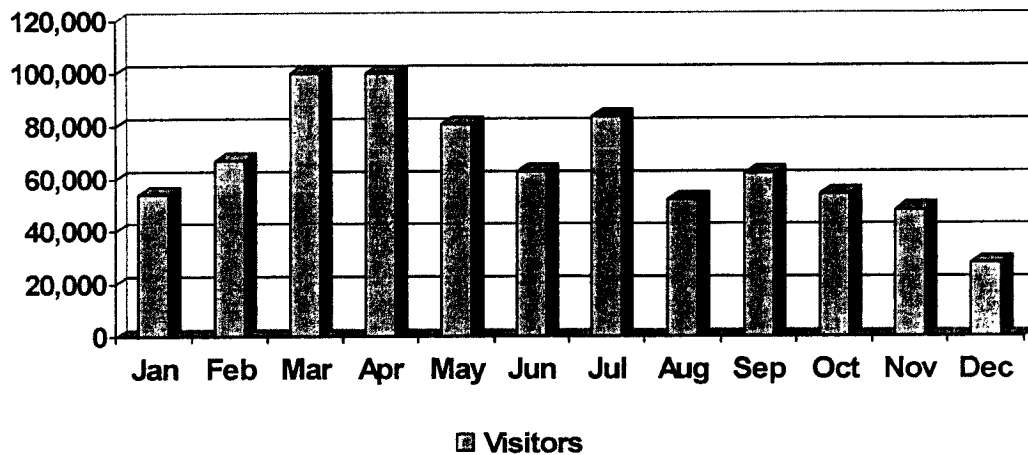


Figure 3 Monthly visitation to Death Valley National Park (2004)

The primary mode of travel to the park is passenger car and these trips represent the vast majority of travel into and out of the park. The primary point of origin for travel is Las Vegas.

### Nevada Test Site

The Nevada Test Site (NTS) is a major facility for storing the low-level radioactive wastes originating from the cleanup of the nation's nuclear weapons facilities. The consequence of this cleanup is that waste is transported to Mercury, Nevada for disposal in Area 3 or 5 at the NTS. Shipments to the NTS represent the closest actual routing developed, and practiced, by the Department of Energy (DOE) for all of its LLW, and TRU shipments to/from the NTS. DOE has already established a precedent for the diversification of shipments utilizing CA 127. This has been established by discussion between DOE generator sites, NTS, and highway carriers. Under this routing strategy the DOE divides shipments between CA 127, and NV 160 during winter months.

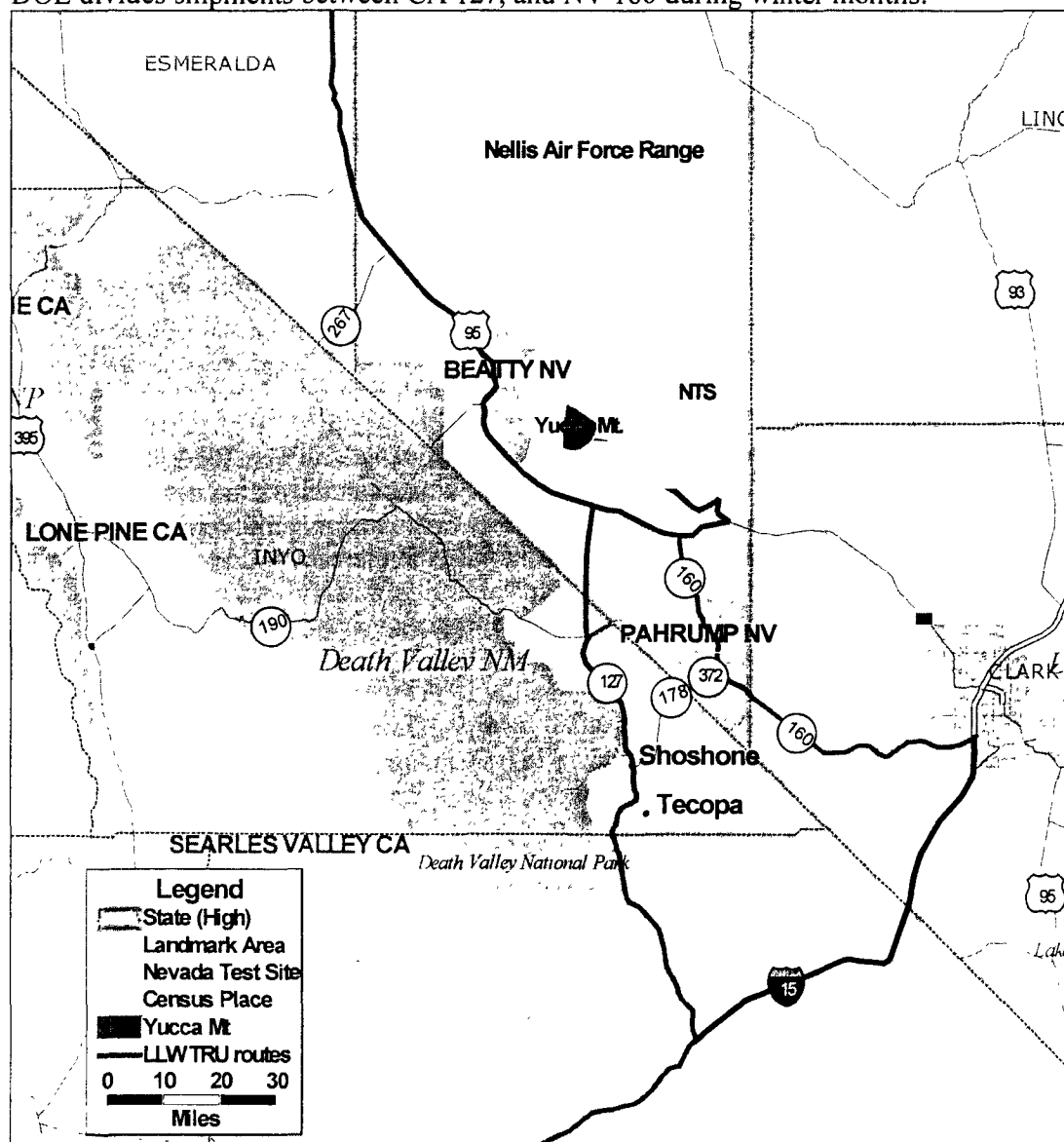


Figure 4 Current routes to the Nevada Test Site used for LLW and TRU shipments

In FY 2005, disposal of Low Level Waste (LLW) and Mixed Low Level Waste (MLLW) at the NTS consisted of 1,390 inbound offsite shipments, from 25 approved generators. These shipments were transported on 19 different approved motor carriers. A total of 2,066,827 cubic feet of LLW from offsite generators was disposed of at the NTS in FY 2005. Three outbound shipments of MLLW were made from the NTS to Envirocare in Utah. Twenty-nine shipments of TRU waste were made from the NTS to Waste Isolation Pilot Plant (WIPP) in FY 2005.

As a result of obligations made by former DOE Secretary Richardson, the transportation of inbound LLW shipments through the Las Vegas I-15 and US-95 Interchange (“Spaghetti Bowl”) and across Hoover Dam have substantially decreased since FY 2000. Due to the events of September 11, 2001, tractor trailers are no longer allowed to travel across Hoover Dam. Therefore routes from the north and south have been used.

A specific reason that has been given by DOE for adopting route diversification over CA 127 is “to limit the number of shipments that travel along CA 127 due to extremely limited and remote emergency response capabilities.” Over the last 5 consecutive years (2000-2004), the annual number of legal weight truck shipments (there have been no overweight shipments) on CA 127 has ranged from 150 to 485 for an average of 21% of total shipments.

### **Pahrump**

Pahrump’s population has grown from approximately 18,000 to 33,000 in 2000. It is currently growing at the rate of 4% annually. This growth has naturally attracted considerable business to the area and Pahrump businesses are major employers. This growth has created an increased demand for transportation in the area. For example, the number of vehicular trips on Highway 160 has increased significantly. Additionally, Pahrump’s amenities have made it an attractive place for some of the first responders in the region to live.

The potential for development seems substantial. Pahrump itself is one of Nevada’s largest cities in terms of land area. The valley is 26 miles long and 8-12 miles wide. Additionally, it sits on a major aquifer that may be able to furnish water to sustain the growth. In planning for this growth pattern, Pahrump has adopted a Regional Master Plan and is developing its first zoning plan.

### **Description of Routes**

Each state maintained highway in the study area is described in this report. State Line Road is mentioned, however, there is no data available for this route (which becomes Ash Meadows Road when it enters Nye County). Each California route is described on four criteria: 1) AADT, 2) trends in AADT, 3) seasonal and hourly traffic peaking and 4) traffic composition. Summaries of the available data are presented below. Less data has been collected for the Nevada Routes. A summary description of the Nevada data is presented at the beginning of the specific Nevada section. Statewide averages are

reported where available. The attached DVD contains the associated GIS data and files for this data.

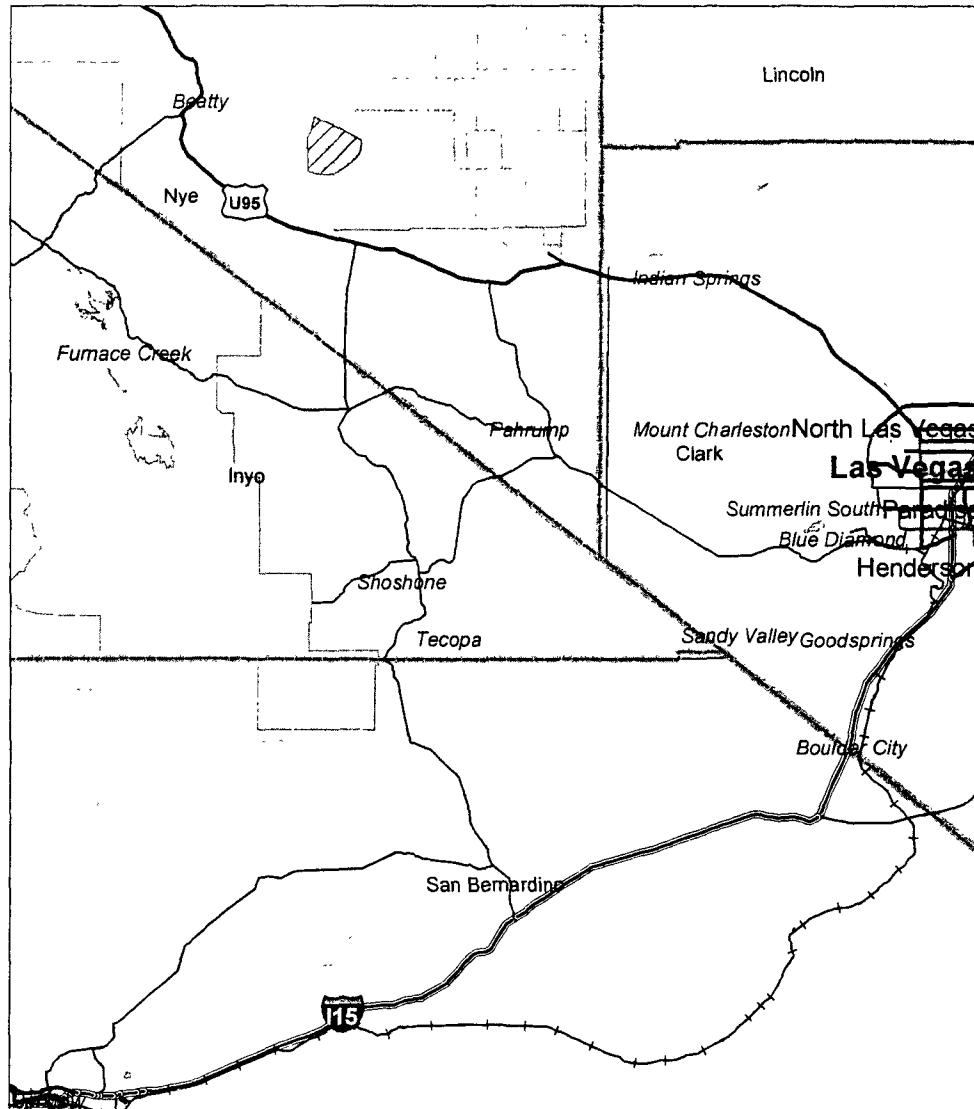


Figure 5 Study Area Roads

## **Definitions**

### **Average Annual Daily Traffic**

AADT is the total volume for the year divided by 365 days. The traffic count year is from October 1st through September 30th. Traffic counting is generally performed by electronic counting instruments moved from location in a program of continuous traffic count sampling. The resulting counts are adjusted to an estimate of annual average daily traffic by compensating for seasonal influence, weekly variation and other variables which may be present.

### **Peak Hour**

An estimate of the "peak hour" traffic at all points on the state highway system is included. Peak Hour is an estimate of the time of day most of the traffic uses the roadway. Peak hour values in the tables below indicate the volume in both directions.

### **Post Mile/Milepost**

A post mile is a mile marker identifying each mile on the road. These markers are referred to in California as "post miles" and in Nevada as "Mileposts." The postmile values increase from the beginning of a route within a count to the next county line. The milepost values start over again at each county line. Postmile values usually increase from south to north or west to east depending upon the **general direction** the route follows within the state. The postmile at a given location will remain the same year after year.

### **Peak Month ADT**

The peak month ADT is the average daily traffic for the month of heaviest traffic flow. This data is obtained because on many routes, high traffic volumes which occur during a certain season of the year are more representative of traffic conditions than the annual ADT. Back AADT, Peak Month, and Peak Hour usually represents traffic South or West of the count location. Ahead AADT, Peak Month, and Peak Hour usually represent traffic North or East of the count location.

## **California State Route 127**

Highway 127 is the most direct route from Interstate 15 to Yucca Mountain. The highway was originally added to the California State highway system in 1933. The AADT on the route varies from 7,400 in Baker in San Bernardino County to 700 AADT near Death Valley Junction.

Postmile	2000	2001	2002	2003	2004
0	700	700	700	700	700
14.749	900	900	900	950	1020
42.149	740	740	850	750	700
49.42	730	730	700	700	700

**Figure 6 Highway 127 traffic 2002-2004**

The volume of daily traffic on Highway 127 remains very stable. The peak hour data is the relationship between the percentage of AADT during the peak hour for both directions of travel and the percentage of traffic in the peak direction.

Postmile	End of the Morning Peak Hour	Morning Peak Hour Direction	Morning Peak Hour Day	Morning Peak Hour Month	End of the Evening Peak Hour	Evening Peak Hour Direction	Evening Peak Hour Day	Evening Peak Hour Month
0	Noon	S	Sunday	March	1 PM	South	Sunday	June
14.749	Noon	N	Sunday	February	1 PM	North	Friday	February
42.149	10 AM	N	Monday	February	1 PM	North	Monday	April

**Figure 7 Morning and Evening traffic peak periods**

The peak hour data are relatively stable throughout Highway 127. The same consistency applies to the peak hour traffic volumes. For morning hours, the percentage of the total daily traffic that occurs during the peak hour is approximately ten percent of the total daily traffic on the roadway. The evening peak hour traffic is approximately seven percent of the total daily traffic.

The number of trucks using Highway 127 is described below. There is no consistent trend in the truck volumes over the time period for which data is available.

Postmile	2000	2001	2002	2003	2004
0.1	91	85	91	114	114
14.70	95	106	95	101	108
42.10	68	68	182	92	220
49.10	219	249	210	210	210

**Figure 8 Daily number of trucks on Highway 127**

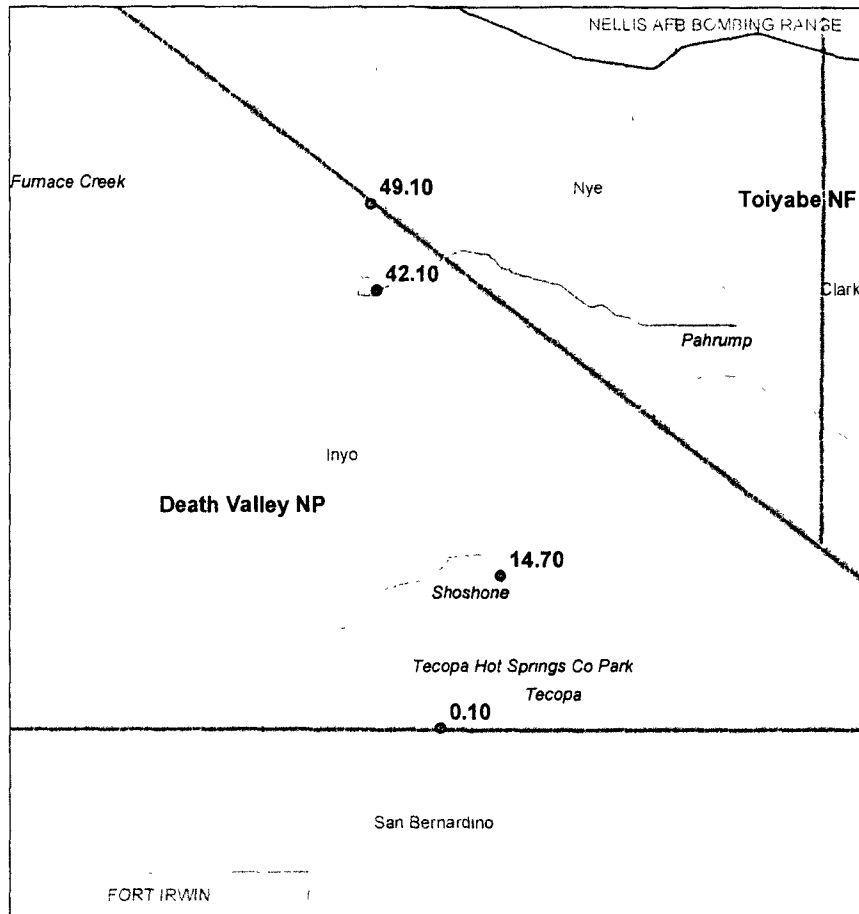


Figure 9 Detail Map of Highway 127 Mileposts

### California State Route 178

Highway 178 connects Shoshone with Nevada State Route 372, which intersects Nevada State Route 160, the main route between Pahrump and Las Vegas. The AADT on Route 178 has not changed substantially over time. The numbers of vehicles using the roadway is also consistent.

	Postmile	2000	2001	2002	2003	2004
178	28	190	190	190	120	120
178	42.93	800	800	900	850	900
178	62.186	950	800	800	850	900

Figure 10 Daily AADT on Route 178



The peak hour traffic on the roadway is below.

Postmile	End of the Morning Peak Hour	Morning Peak Hour Direction	Morning Peak Hour Day	Morning Peak Hour Month	End of the Evening Peak Hour	Evening Peak Hour Direction	Evening Peak Hour Day	Evening Peak Hour Month
42.92	Noon	E	Sun	Dec	5 PM	E	Saturday	March

**Figure 11 Peak hour traffic on Route 178**

The peak hour data are relatively stable throughout Highway 178. The same consistency applies to the peak hour traffic volumes. For morning hours, the percentage of the total daily traffic that occurs during the peak hour is approximately ten percent of the total daily traffic on the roadway. The evening peak hour traffic is approximately seven percent of the total daily traffic.

The number of trucks using Highway 178 is described below. There is no consistent trend in the truck volumes over the time period for which data is available. The number of trucks using California State Route 178 is described below. There is no consistent trend in the truck volumes over the time period for which data is available.

	Postmile	2000	2001	2002	2003	2004
178	42.92	7	7	7	7	7
178	62.186	85	71	71	76	80

**Figure 12 Truck volume on Route 178**

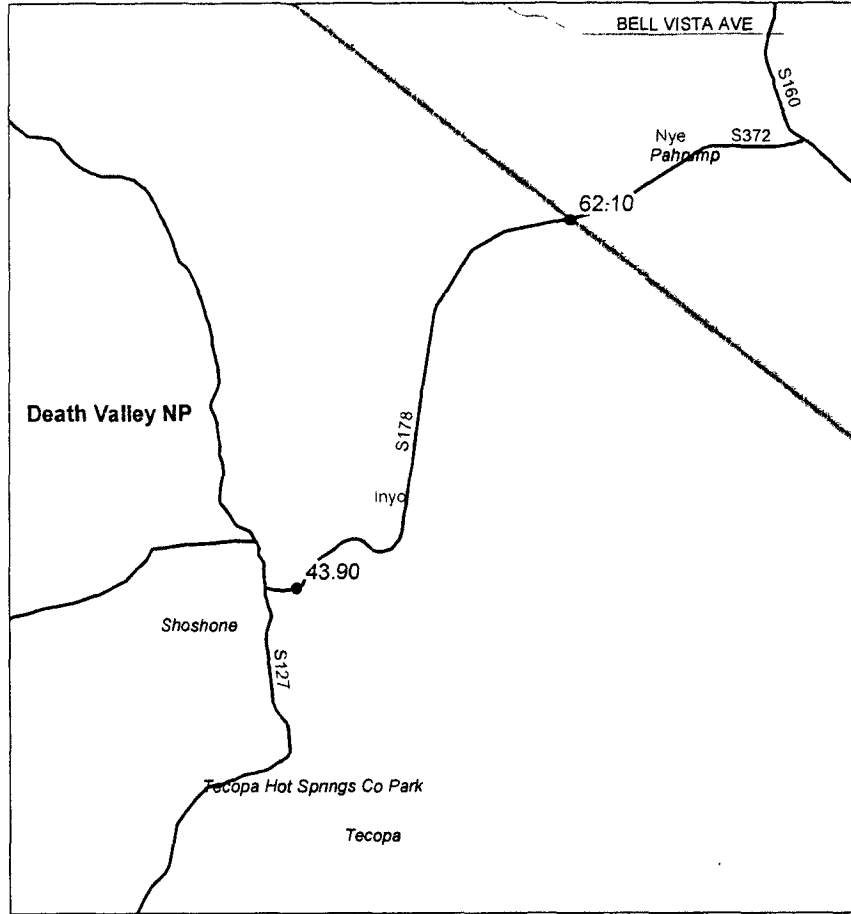


Figure 13 Detail Map of California 178

### California State Route 190

State Route 190 is functionally classified as an interregional Two-Lane Minor Arterial, which provides access from US 395 at the eastern flank of the Sierra Nevada Mountains to SR 127 at Death Valley Junction near the California/Nevada border. Elevations along SR 190 varies considerably from 3,648 feet (1,112 meters) at the junction of US 395 to over 5,200 feet (1,585 meters) near Darwin Road, down to 245 feet (67.67 meters) below sea level in Death Valley, and back up to 2,070 feet (630.94 meters) at the junction of SR 127. Due to the combined effects of extreme summer temperatures, steep grades, and high passes, the potential exists for vehicles to overheat on the route. The segment of SR 190 from PM 42.7 (KP 68.7) to PM 128.3 (KP 206.4) is officially designated as both a California Scenic Highway and a National Scenic Byway. State Route 190 is the only State Highway that provides access from the west to Death Valley National Park, which is a globally significant area.

The AADT on Route 190 has not changed substantially over time. The numbers of vehicles using the roadway is also consistent.

	Postmile	2000	2001	2002	2003	2004
190	9.85	330	330	330	170	200

### Task 3: Transportation Data

190	24.55	220	220	200	400	400
190	110.72	1350	1350	1350	1350	1050
190	140.69	840	840	840	700	650

**Figure 14 Daily AADT on Route 190**

The 2004 peak hour traffic on the roadway is below.

Postmile	End of the Morning Peak Hour	Morning Peak Hour Direction	Morning Peak Hour Day	Morning Peak Hour Month	End of the Evening Peak Hour	Evening Peak Hour Direction	Evening Peak Hour Day	Evening Peak Hour Month
24.55	11:00 AM	East	Saturday	June	2:00 Pm	East	Tuesday	April

**Figure 15 Peak hour traffic on Route 190**

The number of trucks using California State Route 190 is described below. There is no consistent trend in the truck volumes over the time period for which data is available.

	Postmile	2000	2001	2002	2003	2004
190	9.85	3	3	3	1	1
190	24.55	1	1	1	22	22
190	110.72	47	47	47	47	37
190	140.69	33	33	33	49	45

**Figure 16 Truck volume on Route 190**

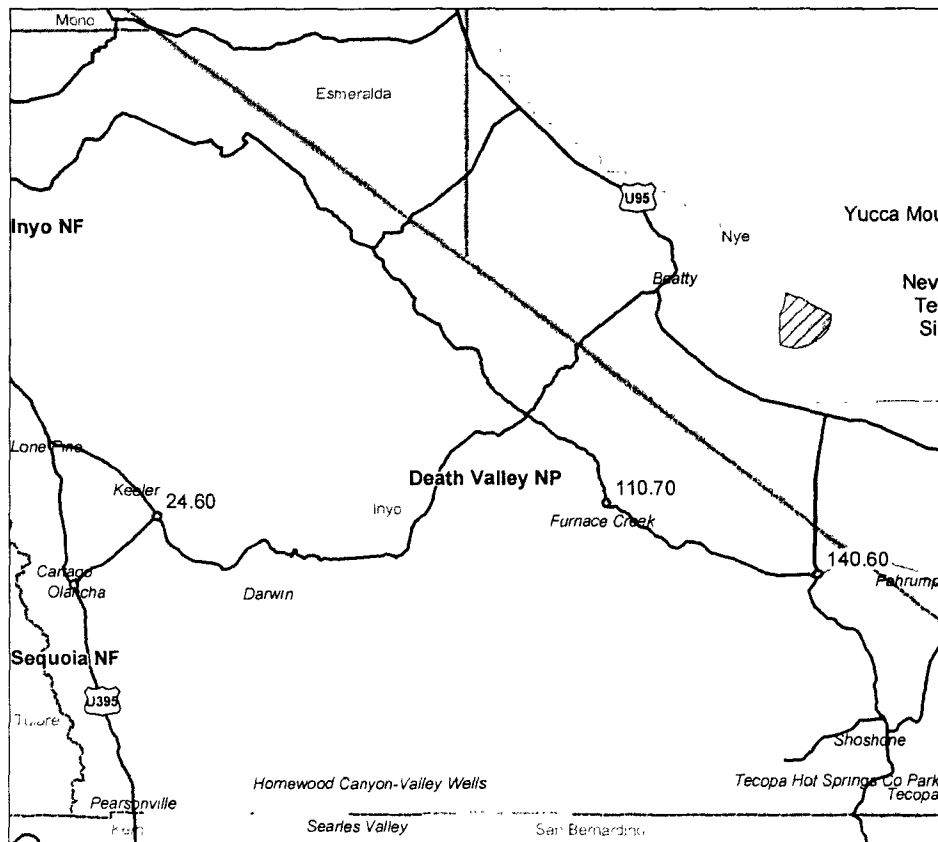


Figure 17 Detail Map of State Route 190

## Summary of Nevada Data

The most recent data available for Nevada is for 2002. In terms of risk assessment the statewide averages are the only ones currently available. The standard passenger car was involved in more crashes than any other type of vehicle. Pick-up trucks and small passenger cars ranked number 2 and 3 respectively. Single unit trucks ranked number 4. The number of motorcycle fatal crashes increased in 2002 to 34 from 20 crashes in 2001. There were 20 in 2000, (these numbers do not include "moped" fatal crashes).

Total number of large trucks involved in crashes has decreased from 3,339 in 2000 to 3,101 in 2002. This reflects a 7.1% decrease. Most crashes occurred during daylight hours. The highest number of crashes occurred in clear weather conditions. The majority of crashes occurred in areas where the speed limit is posted at 35 mph. Friday followed by Thursday had the most crashes by day of week. Most fatal crashes occurred on Fridays and Sundays. The most deadly 6 hours of the day were 4:00pm to 10:00pm; 87 of the 330 fatal crashes occurred during that time period. 76 occurred from 10:00pm to 5:00am, 73 from 5:00am to 11:00am and 62 from 11:00am to 4:00pm. The most deadly hour was from 9:00pm to 10:00pm with 22 fatal crashes.

The deadliest holiday period was 4th of July with 16 fatalities. The next deadliest was Nevada Day, with 15 fatalities recorded. The month of October had the most injury and fatal crashes combined, while February had the least injury and fatal crashes. The Nevada Day holiday period recorded the most fatal crashes involving alcohol with 8. Most fatal crashes occurred in areas where the posted speed limit was 45 mph. Most injury crashes occurred in areas with a posted speed limit of 35 mph. There were a total of 62,237 traffic crashes in 2002; 41,432 (66.6%) of the crashes resulted in property damage only, 20,475 (32.9%) of the crashes resulted in injuries, 330 (.53%) of the crashes resulted in one or more fatalities.

The top ten crash types by severity were:

1. Ran off Roadway & Overturned
2. Pedestrian
3. Ran off Roadway & Other Combo.
4. Rear End Collision
5. Angle Collision
6. Left Turn Collision
7. Rear End Collision
8. Sideswipe-Same Direction
9. Angle Collision

The top contributing factors by severity were:

1. D.U.I. Alcohol
2. Failure to Yield
3. Inattentive Driving
4. Failure to Yield

5. Failure to Reduce Speed
6. Inattentive Driving
7. Failure to Yield
8. Failure to Reduce Speed
9. Inattentive Driving.

The most frequently struck fixed objects along Nevada's highways were concrete barrier rails. There were 1,858 construction zone crashes that resulted in 9 people killed and 883 injured. Male and Female drivers between the ages of 24 and 35 show the highest crash totals.

### ***US Highway 95***

Nevada Department of Transportation classifies US 95 north of the NTS as a principal arterial. Traffic on US 95 between the intersection of Nevada Route 160 and the Mercury interchange.

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
US 95	2550	2780	2855	2940	2960	2980	3110	2800	2,800	3000

**Figure 18 Sample AADT on US 95**

The average speed at this location has varied between 70 miles per hour and 71 miles per hour between 2000 and 2002. The composition of trucks on roads of this type in Nevada in 2004 was: 19.60% truck, 80.40% passenger cars and 0.58% buses.

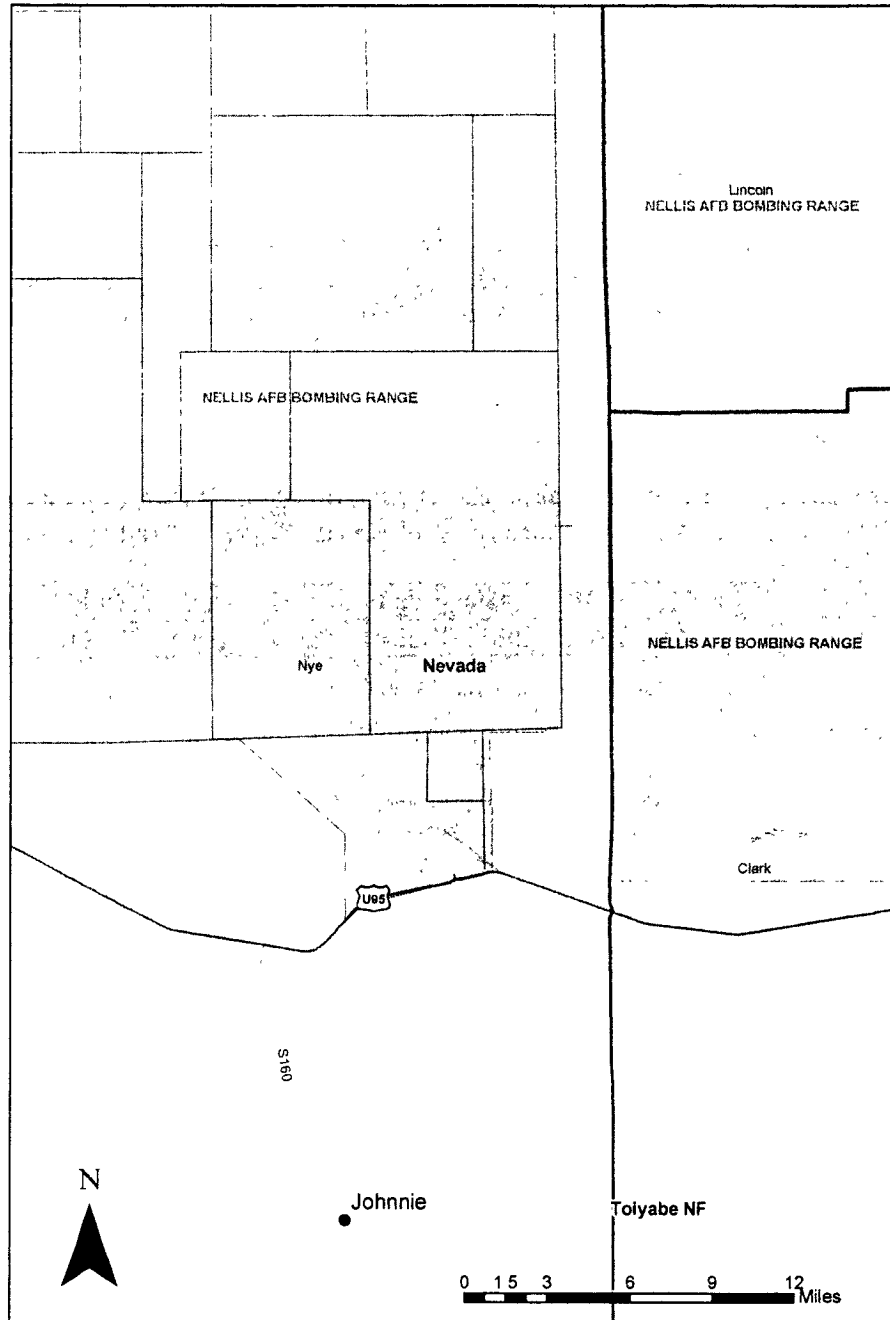


Figure 19 Detail map of US Highway 95

### ***Nevada State Route 160***

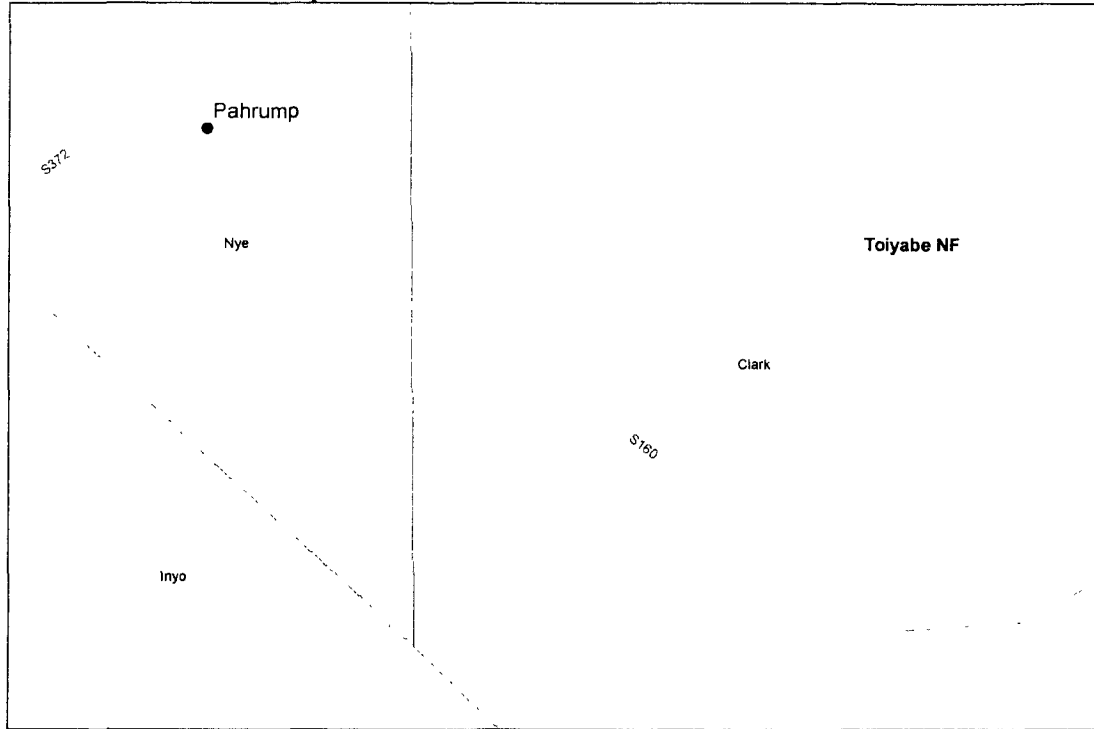
Nevada State Route 160 is the primary route connecting Pahrump with Las Vegas, Nevada. It has been heavily improved in recent years, but continued development in the southwestern part of the Las Vegas valley continues to grow. It is classified as a rural

major collector by the NDOT. The composition of trucks on roads of this type in Nevada in 2004 was: 12.94% truck, 87.06% passenger cars and 0.28% buses.

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
SR 160	1140	1100	1050	1200	1350	1300	1400	1400	1400	1450

**Figure 20 AADT on SR 160 between Pahrump Valley Road and SR 372**

NDOT does not collect speed data for SR 160.



**Figure 21 Detail map of Nevada State Route 160**

### ***Nevada State Route 372***

This road is also referred to as the Charles Brown Highway. This AADT station is .1 mile east of Nevada/California stateline. State Route 372 connects California Route 178 with Nevada State Route 160. It is classified as a rural major collector by the NDOT. The composition of trucks on roads of this type in Nevada in 2004 was: 12.94% truck, 87.06% passenger cars and 0.28% buses.

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
SR 372	700	670	640	600	830	780	1000	800	810	860

**Figure 22 AADT on SR 372**

NDOT does not collect speed data for SR 372.

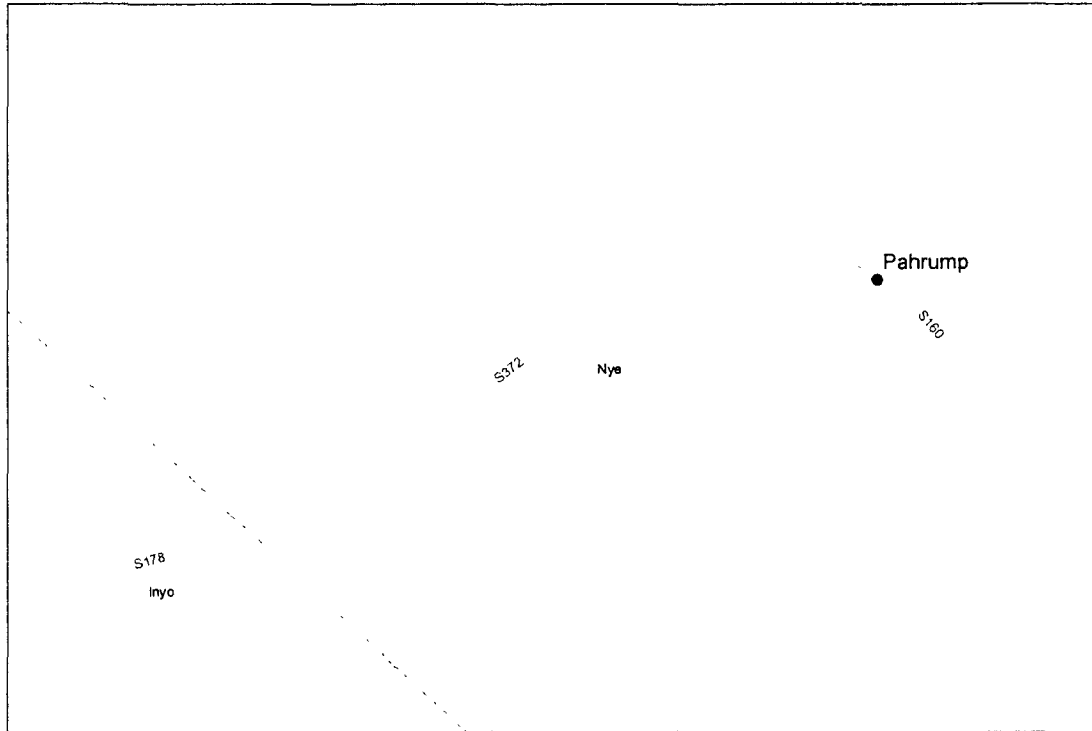


Figure 23 Detail map of Nevada State route 372

### ***Nevada State Route 373***

SR 373 is classified as a rural major collector by the NDOT. It connects California Highway 127 in the south with US 95 in the north. The composition of trucks on roads of this type in Nevada in 2004 was: 12.94% truck, 87.06% passenger cars and 0.28% buses.

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
SR 373	835	720	610	700	660	650	650	570	570	760

Figure 24 AADT on SR 373 en route to Death Valley Junction .5 mile south of US95

NDOT does not collect speed data for SR 373.



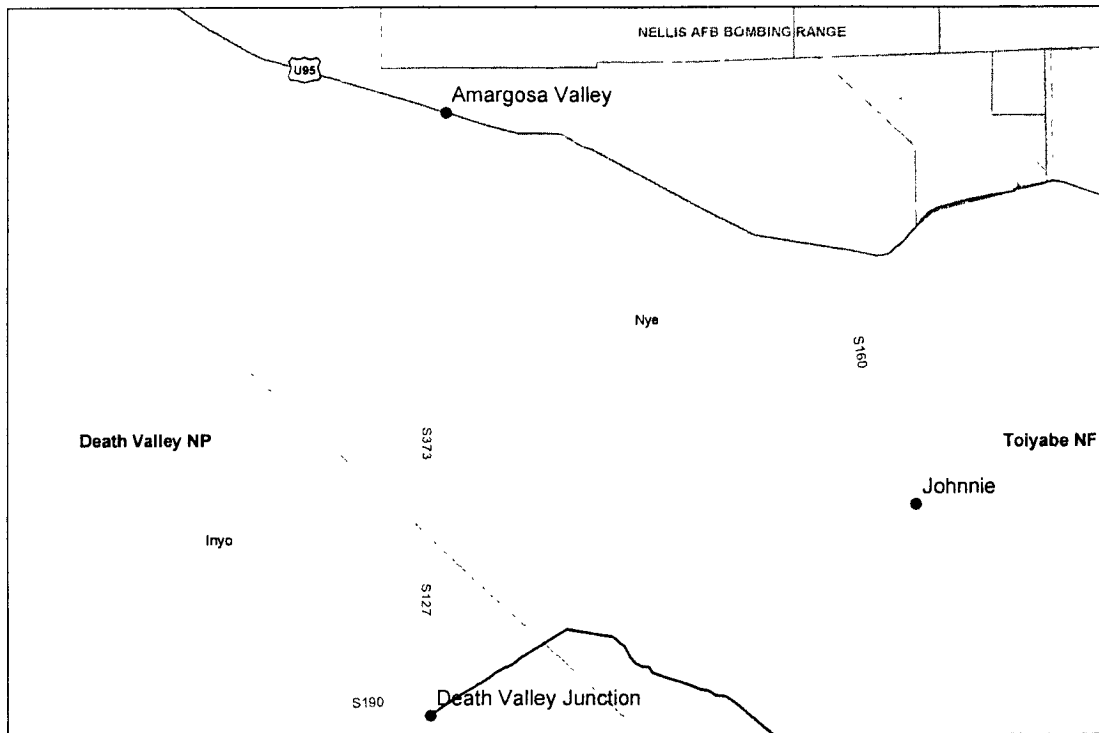


Figure 25 Detail map of Nevada State Route 373

### ***State Line Road/Ash Meadows Road***

There is no data for traffic counts or traffic composition data for State Line/Ash Meadows Road. CALTRANS plans to add a classification station on State Line Road.

### ***Flooding and other natural hazards***

Highway 127 is subject to frequent floods which interrupt use of the highway. The highway is often interrupted in multiple places. In 2004, the highway was flooded in 13 locations and closed.

Weather Data for Furnace Creek, CA (Elev. 178 feet below sea level - Degrees F.)			
Month	Avg. Max. Temp.	Avg. Min. Temp.	Avg. Precipitation
January	64.6	39.1	0.24"
February	72.3	45.6	0.33"
March	80.4	52.8	0.24"
April	89.8	61.9	0.12"
May	99.3	70.7	0.07"
June	109.0	80.3	0.03"
July	115.3	87.8	0.11"
August	113.2	85.0	0.12"

September	105.8	74.9	0.11"
October	92.0	61.6	0.09"
November	75.7	48.1	0.19"
December	65.1	39.4	0.19"
ANNUAL	90.1	62.2	1.84"

Figure 26 Precipitation in Death Valley

Areas where floods typically occur are where the Amargosa River crosses Highway 127. Potential flooding on 127 is significant, because it could delay shipments and cause multiple shipments to seek a safe haven while the flooding subsides and the road is reopened. Such an event would present security problems and could create high routine doses of radiation.

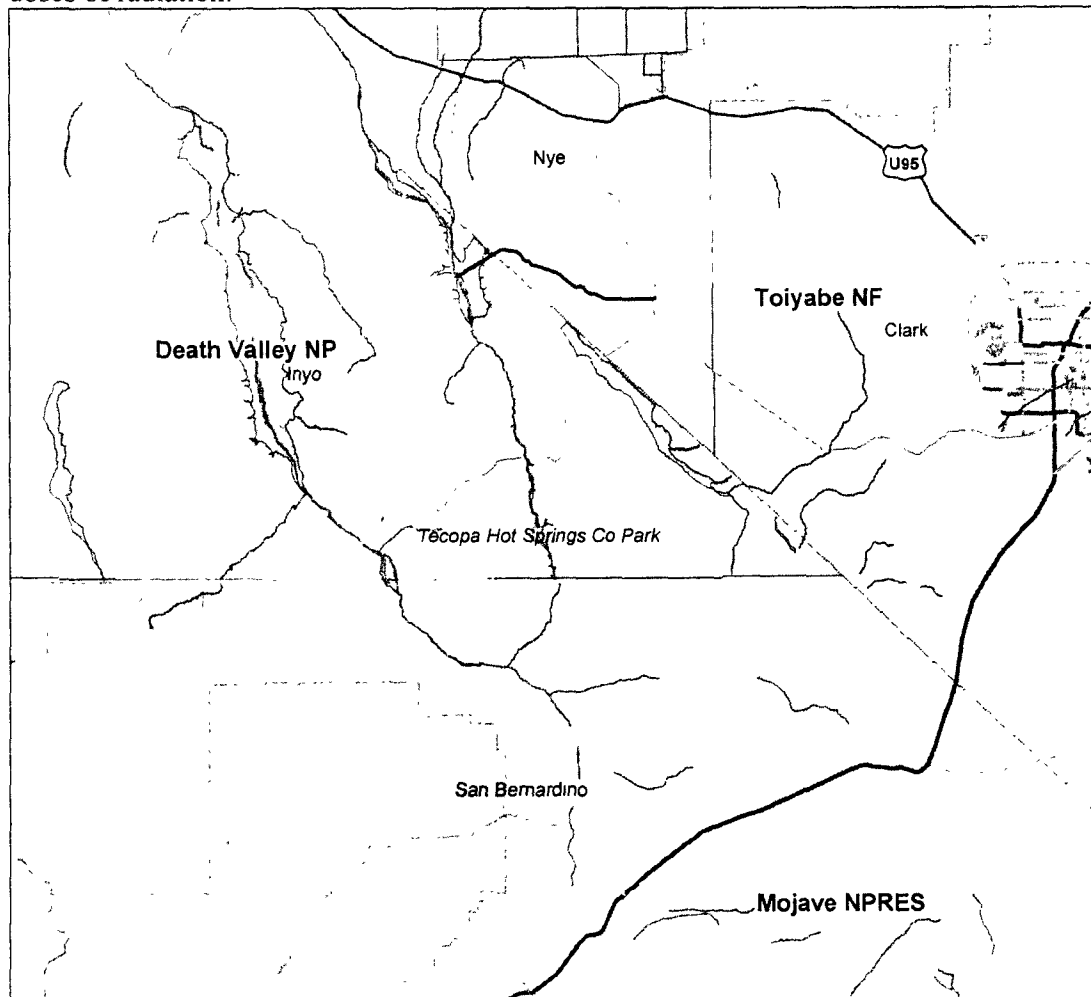
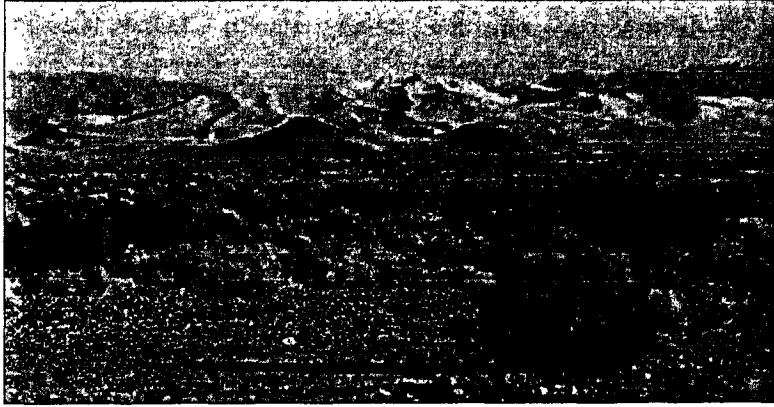


Figure 27 Flooding locations on Highway 127

#### Dumont Dunes

The Dumont Dunes Off-Highway Vehicle Area is located in San Bernardino County, however, visitors arriving from Las Vegas seeking to

use the area typically travel on either 127 from I15 at Baker or from 160 in Nevada. Bordered by steep volcanic hills and the slow running Armargosa River, the region is easily recognized from a distance by its distinctive sand dunes.



The Bureau of Land Management (BLM) estimates that over 130,000 people visit the area each year. Many of these people arrived there from Las Vegas.

Estimates are that 50% arrive from California and 50% from Nevada. Because of this high level of visitation, the San Bernardino County Sheriff's office has had to deploy a mobile jail facility and on-site helicopter pad and deputies. The peak months of visitation at the Dunes are on major holiday weekends between November and March.

## **Appendix 1 Data**

The hard drive enclosed with this report contains the data used herein. The data falls into five broad categories:

### ***Elevation and Land cover***

- Digital Elevation Models
- Digital Raster Graphics
- Aerial Photos

### ***Transportation Data***

- Roads and Highways (including State Line Road)
- Highways by classification
- Accidents/Incidents
- Line layer with truck composition, AADT, and accident data

### ***Hydrographic Data***

- Named streams and rivers
- Flood history in Inyo County
- Water bodies

### ***Demographic Data***

- Counties
- States
- Populated Places (points)
- Populated Places (areas)
- Census tract
- Census Block
- Census Block Group
- Parks
- Landmarks
- Private Property
- Federally Owned Property

### ***Yucca Mountain Specific Data***

- Nevada Test Site
- Nellis Air Force Range
- Yucca Mountain Controlled Area Boundary
- DOE data sets for Yucca Mountain ( e.g. Hydrology, Geology, Groundwater, etc...)